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IN FOUR SECTIONS

Section 1

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Mechanical Cost Accounting For Color Printing

By

ADRIAN METZGER, Auditor
Schmidt Lithograph Company,
San Francisco, Calif.

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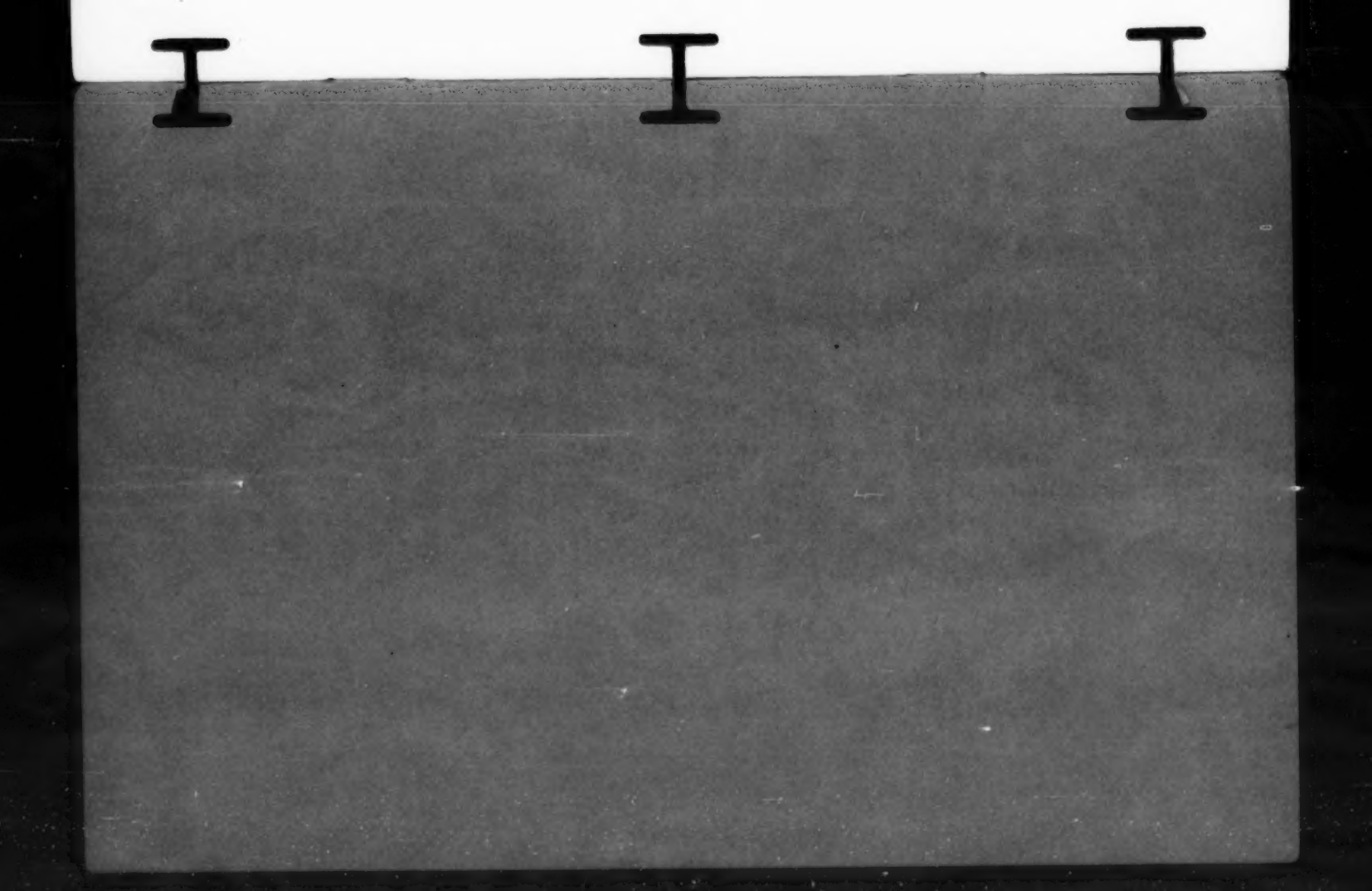

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EDITORIAL DEPARTMENT NOTE

The association tries to bring to its members new and unusual developments in accounting practice. In this issue of our Bulletin we are submitting to the members for their consideration the adaptation of mechanical accounting equipment to the field of color printing. The same system should work equally well in the ordinary job printing plant and in other places where the job is the unit of costing. This is another instance in which mechanical equipment is being used as a means of securing complete and accurate accounting information quickly and economically.

The author of this paper, Mr. A. Metzger, served the Southern Pacific Railroad Company as Statistician for several years. In 1918 he joined the public accounting staff of Klink Bean & Company (now Lybrand, Ross Bros. & Montgomery) and remained in the public accounting field until 1920. At that time he engaged in the private practice of accounting which he continued until 1923 when he accepted the position as auditor for the Schmidt Lithograph Co., which position he still holds. Mr. Metzger is greatly interested in the work of the N. A. C. A., and is now First Vice President of the San Francisco Chapter.

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NATIONAL ASSOCIATION OF
COST ACCOUNTANTS
OCTOBER 15, 1931

MECHANICAL COST ACCOUNTING FOR COLOR PRINTING

MR. PRESIDENT, members of the San Francisco Chapter, and visiting firemen:

This system for the gathering of color printing cost data has been in one sense, a distinct disappointment. It is something entirely new in the adaptation of this particular kind of accounting equipment, and as far as I know, entirely new in the field of color printing. The machine itself, although intricate in construction, is simple in operation, but the plan was designed with this thought ever in mind: Every new system carries concealed charges of high explosive. These usually go off at irregular intervals during the first few weeks of operation, and they are always timed to explode at times of peak optimism. Sometimes, in fact, they all go off at once, and the janitor sweeps up what is left of the system, and the cost accountant seeks for new fields in which to flounder.

This plan of ours went into effect on December 1st, 1930, with a fanfare of trumpets, but in the dim background was the wail of a saxophone. After all it was just a theory. Wise heads had said it couldn't be done. When was the first concealed charge to go off, and possibly shatter the dreams of months?

We were really disappointed. The darned thing worked one hundred per cent from the jump. And you can tell that to Mr. Ripley.

Before going into the actual workings of the system, it would be well to give you as graphic a picture as possible, of the Schmidt Lithograph Company's organization, and the character of their business.

The departments in the plant are divided into two groups, viz., direct and indirect. The direct department renders the man time and machine time reportings that form the basis of the individual order costs, and the indirect departments are prorated on logical and practical bases, to the direct departments which they serve. And for the benefit of some of the sharpshooters who are laying for me, it might be added that there are no arbitrary prorates on "per cent to total."

At this particular point it might not be amiss to explain why we

use individual order costs at all. The individual order cost seems to be always under fire these days. It is spoken of in terms of near-contempt. It is looked upon as an anachronism. In some minds it bears the same relation to modern accounting as the gently undulating bustle of mid-Victorian days bears to contemporary feminine dress.

We are not, in the Schmidt Lithograph Company's plant, strangers to standard costs. We use them in our paper coating plant. And in our corrugated paper products division we base our cost of goods sold on the value of monthly physical inventories, costed at experience percentages applying to various corrugated commodities at sell. These experience percentages, incidentally, are based upon Bedaux costs during the period that individual order costs were maintained.

But in the color printing business, where a job is sold before it is manufactured, and where no two jobs are alike, and where it can seldom be foretold with accuracy just how a job is to be processed, it is felt that historical costs are necessary. It is realized also that historical costs must be served hot if they are to be digested at all. Hence the system about to be discussed, which gives to management in a readily readable form, all the facts in connection with a job, before every one concerned has forgotten what it is all about.

* * *

So, beginning at the beginning, we'll start in the Order Department, where the salesmen's orders are transcribed on a billing machine. A thin, tough paper is used that will permit of many carbon copies. And one copy of the order is sent to each department in the factory that will have anything to do with the order. The first copy goes to the Paper Stock Department which has to furnish the paper, and the last copy to the Shipping Department which sees it off with fluttering handkerchiefs.

All work done on an order up to, but not including, the Transfer Department, is reported by order number. This would embrace all elements of preparatory costs, such as engraving, proving, and all the functions of photo-composing.

In the meantime, the Factory Office, or Planning Department, has grouped these orders according to color combination, and has

decided on what size press they are to be run. For instance, they might take case labels for various customers that are to be lithographed in five colors. We will say that it is a 25,000 sheet run. One customer wants one hundred thousand. The Transfer Department will lay this design four times on the aluminum plate that is to go into the press. There may be seven or eight or possibly more customers' jobs on the same plate.

From the time that the designs are transferred to the press plates until the orders are cut and wrapped in the Finishing Department, the job is known by the number of the form. All preparatory work, up to the form stage, is reported by order number.

The first, or preparatory cost, we might designate as the individual order cost. The individual costs are kept on records entirely separate from the form costs.

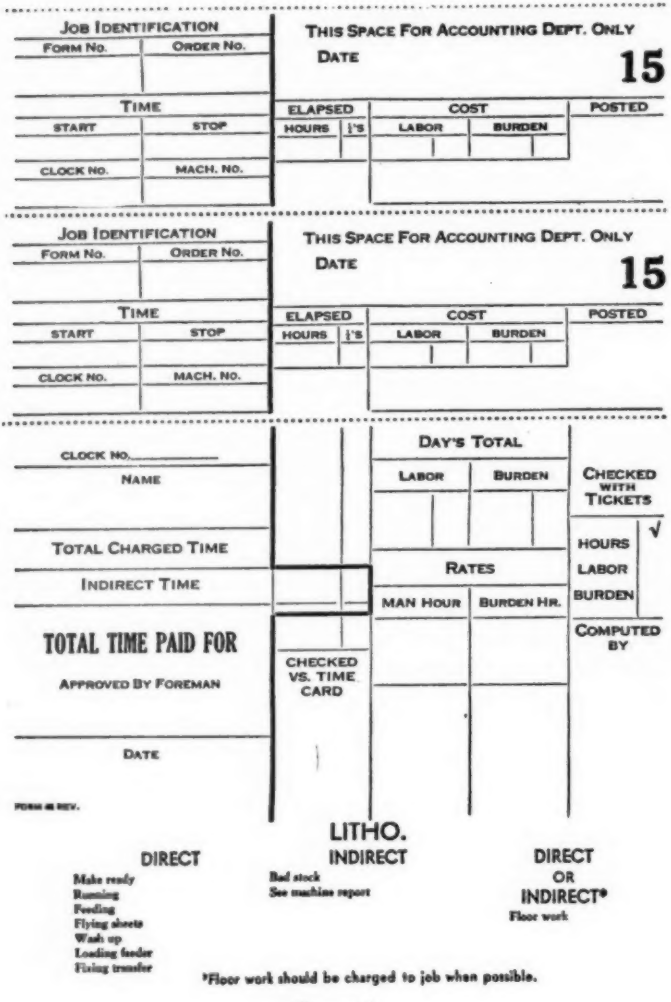
When the form costs are completed, they are prorated to the several individual order costs on the basis of the relative area of each job to the total form. The cost thus prorated embraces transferring costs (to the press plate) of paper, ink, manufacturing supplies, man time and machine time.

The prorated costs are finally added to the individual costs, but this will be discussed later on.

You will note in the list of departments divided between "Direct" and "Indirect" that the "Direct" departments are further broken down between "Man Hour" and "Machine Hour" departments.

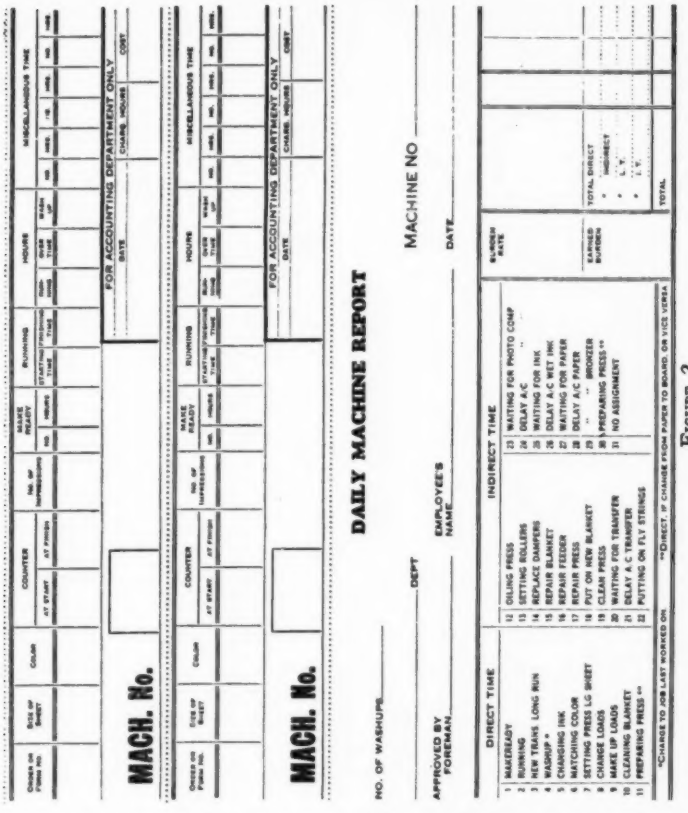
The "Man Hour" departments are those in which no mechanical equipment is employed, or those departments which employ mechanical equipment on which no machine rate is set. In such departments the budgeted direct hours for the period are divided into the department expense, and the resultant man hour rate is assessed against all time put in by that department, in addition to the bare payroll cost according to the workman's rate of pay.

The "Machine Hour" departments are those in which the department burden is absorbed by application of machine burden rates. The workman's time is charged on the basis of pay rate, in addition to the machine time charged. That is, in neither "Man Hour" nor "Machine Hour" departments is there a rate that includes both the pay rate and the overhead. This is kept separate



*Floor work should be charged to job when possible.

FIGURE 1



DAILY MACHINE REPORT

NO. OF WASHUPS_____ DEPT_____ MACHINE NO_____

APPROVED BY FOREMAN_____ EMPLOYEE'S NAME_____ DATE_____

DIRECT TIME		INDIRECT TIME		BURDEN RATE		
1 MAKEREADY	12 OILING PRESS	23 WAITING FOR PHOTO COMP				
2 RUNNING	13 SETTING ROLLERS	24 DELAY A/C "				
3 NEW TRANS LONG RUN	14 REPLACE DAMPERS	25 WAITING FOR INK				
4 WASHUP *	15 REPAIR BLANKET	26 DELAY A/C WET INK				
5 CHANGING INK	16 REPAIR FEEDER	27 WAITING FOR PAPER				
6 MATCHING COLOR	17 REPAIR PRESS	28 DELAY A/C PAPER				
7 SETTING PRESS LG SHEET	18 PUT ON NEW BLANKET	29 " " BRONZER				
8 CHANGE LOADS	19 CLEAN PRESS	30 PREPARING PRESS **	EARNED RUNNING	TOTAL DIRECT		
9 MAKE UP LOADS	20 WAITING FOR TRANSFER	31 NO ASSIGNMENT	"	INDIRECT		
10 CLEANING BLANKET	21 DELAY A/C TRANSFER		"	L. W.		
11 PREPARING PRESS **	22 PUTTING ON FLY STRINGS		"	L. W.		
*CHARGE TO JOB LAST WORKED ON.	**DIRECT, IF CHANGE FROM PAPER TO BOARD, OR VICE VERSA			TOTAL		

FIGURE 2

for the reason that in the case of large volume orders management frequently asks as to the amount of burden which the job has absorbed, as well as how much naked payroll cost and material cost.

Time Reporting

You will note two forms of time card, Forms 1 and 2, each consisting of a master ticket with perforated stubs attached. One of these, Form 1, is for the reporting of man time, and the other, Form 2, for machine time.

Our company uses the ordinary "in and out" time clock, so that it is necessary for the workman to enter on his job stub the time on and off a job.

Each morning the timekeeper and his assistant make the rounds and gather the man time tickets. They extend the elapsed time on each job, which, when added to the workman's own computation of "indirect" time, adds to the total time reflected by the clock card.

There is a slight variation in these cards for each department. On the master ticket is a tabulation showing what kind of work is considered "direct" and "indirect" so that there may be no confusion in the employee's mind as to whether or not time should be charged to a job.

When the time cards have been extended as to hours, and proved with the total time earned, they are passed to a machine operator in the Cost Division of the Accounting Department. On her desk is a well indexed tray of employee cards showing employee number, weekly wages and hourly rate of pay.

She enters on the card the hourly rate and also the burden rate for the department, and extends the value of time worked on each stub, which is proved by footing to value of time indicated on master ticket.

When the cards have been extended and proved, adding machine runs are made of applied labor and applied burden, by departments, for the day. And these department totals are transcribed to a running daily record for the month, which is used in determining, at the close of accounts, how much burden has been earned in each department, and what proportion of the payroll has been applied in productive or direct labor.

The next step is to detach and sort the job stubs. These are arranged in numerical and departmental sequences, so that they may go through the posting machine ad seriatim.

Similar procedure is followed with machine time tickets. The assistant timekeeper handles these in the afternoon, when all man time calculations have been completed. He enters in each ticket the machine rate and makes the extensions. The machine time tickets are posted separately, after the man time postings have been finished.

It might be said here, that the plan contemplates costing on Wednesday, of work done on Monday. We allow one day for gathering the original cost data and checking carefully to see that time has been reported properly. This takes time and painstaking effort. Because no matter how efficient the method of gathering and presenting facts, if the facts are sour they aren't worth much. Of course we are working diligently on a device to make every factory hand an accountant, and in fifty or sixty years we might report progress. But at the present time, the less said about it the better.

Well, it's Wednesday morning, and we're going to shoot Monday's work through. And if you think we were loafing Tuesday, you're welcome to come out and see for yourself. Remember that we have twenty-four lithograph presses, eight block presses, three embossing machines, three varnish machines, and between three and four hundred men reporting their time on jobs, and they work on from one to ten jobs in a day. And all these individual job tickets have to be arranged so that they may go quickly through the machine process.

First, let's consider the forms on which these tickets are posted. (Here's the only place where the speaker at a chapter meeting gets a break. The usual set-up of forms exhibited at a talk like this, is so bewildering that even the sharpshooters just look wise and pass 'em along. You can't argue with a piece of stationery, especially when it's of a good size and is full of mysterious columns. You may be confused, but I'm having the time of my life.)

There are four different forms employed. Form 3 is the man time sheet, which also picks up the man hour burden; Form 4, the machine time sheet; Form 5, a material sheet; and Form 6, a final summary which will be discussed last.

The Posting Process

Before we go into the posting process, consider the source of this information, which is the time ticket. Visualize if you please, a box in which there are several hundred of these man time tickets, arranged in numerical sequence, according to individual job, or form number (the form being a combination of jobs). These have been handed to the posting machine operator, and are at a

PAYROLL AND MAN HOUR BURDEN CHARGES

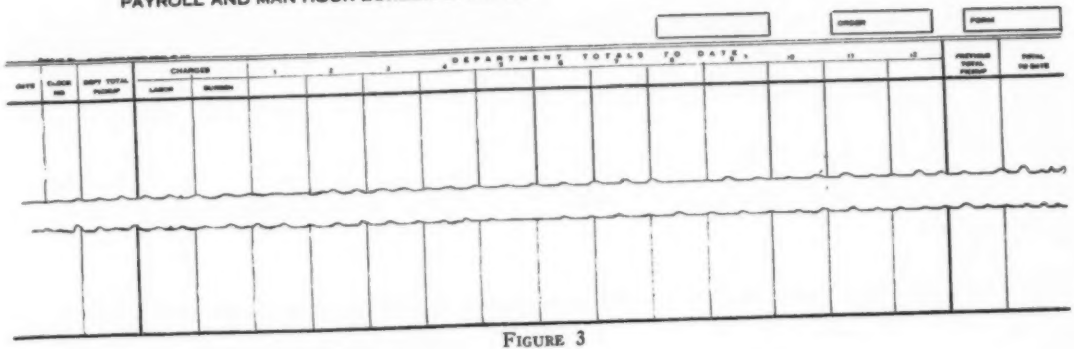


FIGURE 3

MACHINE HOUR CHARGES

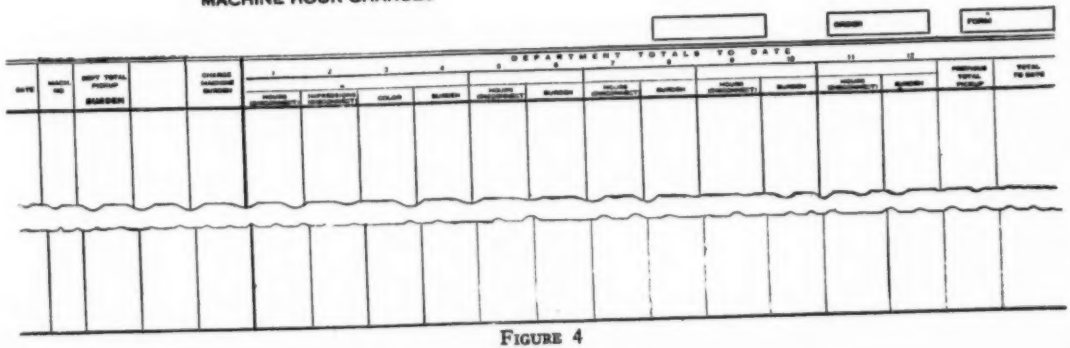


FIGURE 4

MATERIAL, OUTSIDE PURCHASES AND SKETCH COST

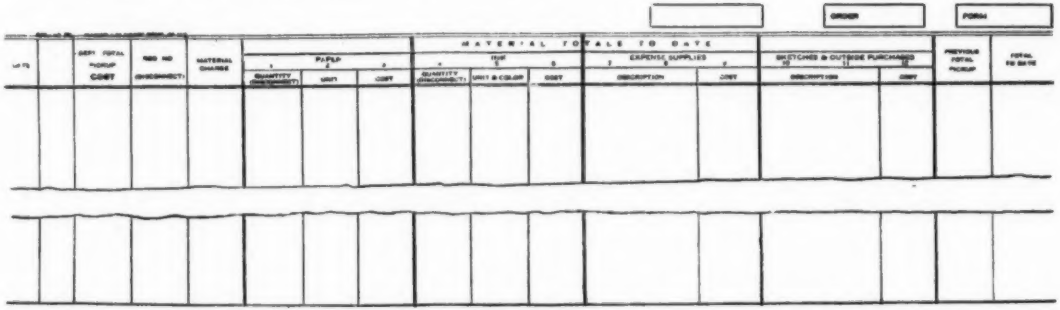


FIGURE 5

SUMMARY OF FORM AND ORDER COST

DATE CLOSED

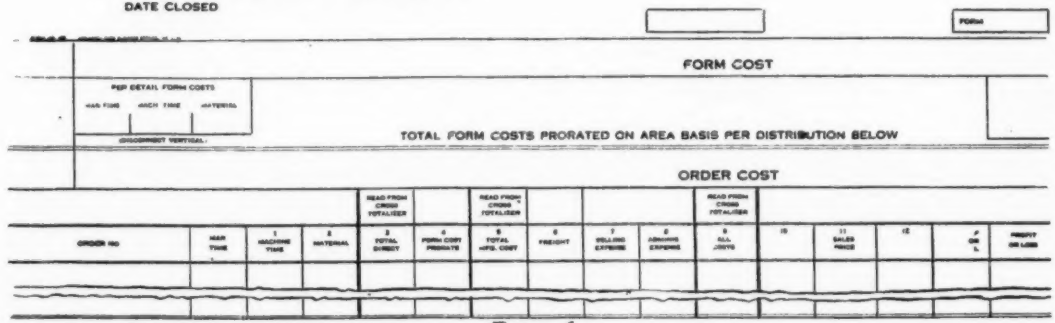


FIGURE 6

table on her left. Before her is the machine, and at her right, two trays in which are the sheets to which postings are to be made. In one tray are the individual job cost sheets and in the other are the form cost sheets.

Now a word as to the machine. There are on this machine nineteen vertical registers and two cross totalizers. Seventeen vertical totalizers do not function as far as accumulation of columnar totals is concerned, until the final stage of summarizing, which will be gone into later. For the purposes of accumulating postings they might as well be shells, as their only purpose in the preliminary or posting work is to throw one or both cross totalizers into "disconnect," "add," or "substract," according to the result desired. This is accomplished by cams set in different positions.

The two end totalizers are used as visual proof of pickup and are beyond range of the sheet. The form itself embraces but seventeen value columns.

You may possibly understand the layout better if I explain first why we have two cross footers on the machine. In the first place, in developing this idea of the mechanical accumulation of lithographing costs and block press costs, we were actuated by two prime motives. The first was to eliminate intermediate or subordinate records, with the loss of time that they entail, and secondly to obtain a typewritten history of the job, that would be legible to begin with, that would give a comprehensive history of any combination runs, regardless of how many jobs were run on the form, and that would, when the last posting was made, give automatically the total costs accrued by departments, and in total. We did not want to have to hold the accounts open at the end of the month until machine operators had handled the figures a second or third time. We wanted to handled these figures once and be done with it. We wanted to be able at the close of business of any day, to take an adding machine run of our cost sheet totals and say "This is the inventory of Work in Process." In other words, we wanted every day to be the end of the month. And it is, *now*.

So the reason for two cross totalizers is this: One accumulates the charges by departments. The other accumulates the total charges against the job as a whole. And this is the way it works.

Take Form 204, (Figure 3), "Payroll and Man Hour Burden Charges." We'll follow through from the first entry. The date shown by rubber stamp on the time ticket is entered in the first column. The employee's clock number follows. The next column, "Dept. Total Pickup" we will ignore, since it is to be assumed that there have been no previous entries.

The first figure to be typed is in the column headed "Charges." Let us say that the first work involved in the manufacture of this particular job occurs in the Artist Department. The operator types in the labor and burden separately in the two columns provided for that purpose, and if no other employee in that department has worked on the same job she moves the typing position to column 1, heads it "Artist," and from the first cross totalizer reads the total of the two amounts that have just been posted.

Now it should be understood here that the cams on the two vertical totalizers over columns "Labor" and "Burden" are set so that figures typed in those columns add in both first and second totalizers. Indicators on the machine show the operator whether the figures are adding, substracting, or doing neither.

But the cams on the third totalizer, under columns 1 to 12 inclusive, are set so that any figures typed in this column are subtracted from first totalizer, and disconnected from the second.

When the operator reads from the first cross totalizer, the total of her postings in first two columns, and types this total in the third column, or column No. 1, the first cross footer is then cleared. She types a star symbol after the figure, which shows that the proper total has been typed, else the symbol could not be depressed.

The next ticket may be for the same job, in another department, possibly the Photo-Composing. The same procedure is followed as before, and the column numbered 2 is headed, the total entered, and the star shown after the entry.

We will assume that for the day there are no more postings to be made against the job. The second cross totalizer has been storing postings for both departments, which job total is to be entered in the "Total to date" column. The column headed "Previous Total Pickup" is not used in this entry, since there have been no previous job totals. The totalizer cams over "Total to Date" column are adjusted to "Disconnect" in first cross and

subtract from second, so that when the accumulated job total is typed, the second cross is cleared, and a triangle symbol proves that the proper figure has been used.

On the next day the department totals are entered in column following clock number, which is set to disconnect from second cross totalizer. The second day's charges, therefore, added to the previous department total, gives an accumulated total to date. When the right hand side of the sheet is reached, the same procedure is followed with regard to total job costs, with the result that when the last figure is typed, the total represents every payroll or man hour burden charge that has accrued.

Of course, there is nothing in this idea that differs from the basic principle of machine bookkeeping, as used in receivable and payable accounting. What we have done is simply adapt a common procedure to work that was formerly accomplished through painful and tedious clerical routine, posting to intermediate records, footing, and transferring totals to summary sheets which then had to be footed again, and after they were all finished they required a quick and practised eye to interpret the results.

We will next consider Form 205, (Figure 4), "Machine Hour Charges." Fundamentally this form is the same as the one previously discussed. There is no payroll charge entered, since the records of original entry in this case are the machine time tickets. (It should be understood that the time of men operating the machines has been reported on man time tickets, and in departments employing machines on which a burden rate is set, there are no burden charges to Form 204.)

On Form 205 the machine number instead of clock number is used. (Pardon the digression, but this system is useful in more ways than one. Mrs. Metzger has been suffering from insomnia for some time. The other evening I read her this paper, and she had the first good sleep in months.) The department total pickup is the same as on Form 204. The next column is not required. In the column following is the posting from the machine time ticket, which follows in principle the man time ticket.

For purposes of analysis, the hours employed and number of impressions made are entered in columns 1 and 2. In order that these results do not affect the totalizing mechanism, the machine

is disconnected so that the registers do not function. The color worked on is entered in column 3, since it may be that the management will want to know how many hours were employed on light blue, red, etc. In column 4 the value of machine time, as reflected by machine time tickets, is posted.

This first group of four columns differs from the grouping of succeeding columns for the reason that only one press department would be working on a job. If the order covers cartons, the first press operation would be either lithographing or printing, so that the heading over the four columns would be "Lithograph or Block Press Department." The second group of columns, consisting of two, would be headed "Box Department" and under this caption would be entered the time of cutting and creasing machines, and automatic gluers. The rest of the sheet is self-explanatory, as the extreme right hand side reflects the total for all departments to date.

Material Costs

Form 206, (Figure 5), is the gathering medium for all material costs, or everything other than labor and burden. Requisitions, numbers and quantities are kept from interfering with values, by disconnecting the adding mechanism. The three main divisions are "Paper," "Ink" and "Expense Supplies." These are briefly described so that results may be easily interpreted should the final cost figures prove to be out of line.

The fourth group, "Sketches and Outside Purchases," is used for composition or other work purchased on the outside.

Final Summarizing

When the form has been closed, as we say, or when the products lithographed on one form have been shipped out, we are ready for the final summary.

Individual order costs covering preparatory work on all jobs that have been run on this form, are pulled from the tray, as well as the four sheets covering the form cost.

The machine operator, or the comptometer operator who extends the tickets, has already calculated the area which each job occupies on the form.

On the summary sheet, (Figure 6), at the top, is posted the total man time cost, total machine time cost, and material cost. On the opposite side of the form is a square area in which the cross footing of these three items is typed, which clears the second cross totalizer.

For this final summarizing the cams on several of the vertical registers are changed so that they will reverse their effect on cross totalizers. It should be borne in mind that in the posting of job tickets, most of the registers subtract instead of add. This is because when the cumulative total is entered in a certain departmental "total to date" column the first cross register must clear. This changing of cams takes about three or four minutes a day.

All the orders on the form are typed vertically at the left of the sheet, being identified by number. The man time is entered first, then machine time and material, although usually the preparatory cost is confined to man time. These figures are accumulated in the first cross totalizer, from which the total preparatory or individual costs are read and typed in the "Total direct cost" column. This column is disconnected from the cross totalizer so that the figures are not cleared. To this is added the prorate of form costs on an area basis, which gives a "Total Manufacturing Cost." This is also read from the cross totalizer which still carries the cumulative total. Then Selling Expense, according to established percentages, is added, as well as Administrative Expense, and finally freight, if laid down at destination. This is obtained from a card memorandum prepared by the cashier at the time he pays the freight bill. There is then available in the cross totalizer, the grand total of all manufacturing costs, overhead and freight, which is typed in its column. Next comes the selling price as disclosed by the final billing, and the net profit or loss is reflected by the balance in the cross totalizer. The sale is *deducted* from the cost, and the profit is read from the cross totalizer and recorded in the Profit or Loss column. Should the transaction result in a loss, the balance is read by lifting a small "window" beneath the complimentary figures and adding one cent to the amount shown.

In the meantime, the vertical totalizers, which have not been required during the cost gathering process, have been accumulating the figures typed in the various columns, so that when the last

order has been entered on the summary, there are vertical footings available for each column.

These are then entered at bottom of the tabulation, being reversed in red ink by depression of the credit key, and when the right-hand side of the sheet is reached, all registers are cleared, and the summary has been balanced up and down and across.

This summary is then the top sheet of the file, or history of that particular transaction, or form. It shows, by order numbers, what profit or loss has resulted, how much burden has been absorbed, how much material has been consumed, how much payroll cost has been applied, and how much selling and administrative overhead has been taken care of.

Immediately following the summary, are the three sheets that analyze labor, overhead, machine time and material cost for the form as a whole. Following the form cost analysis, are the sheets covering individual order costs, arranged in order number sequence, so that a complete detail is available should any feature of the summary invite inquiry into details.

The whole set of sheets is wire-stitched together and while bulky in comparison to the unsupported pencil summaries which it supersedes, eliminates, it should be remembered, all the intermediate posting media and cumbersome pencil records that had to be disinterred in the past, when a question arose as to "why and wherefore."

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